

DPD-4656-59

10 July 1959

**MEMORANDUM FOR:** Deputy Director (Plans)  
**THROUGH** : Acting Chief, DPD-DD/P  
**SUBJECT** : Catadioptric Lenses, Improved Emulsions and Sensors  
**REFERENCE** : Memo for C/TAS/DPD-DD/P from DD/P dated 26 June 1959, Subject: Electrophotography and Catadioptric Lenses (DD/P 4-6227)

1. While it is true that a catadioptric lens system is one possibility in the P&E proposals for GUSTO cameras, the final determination of the type of lens system to be used will depend upon the selection of a particular airframe. However, I will be able to explore more deeply the problems which you raise in a discussion with Rod Scott, hopefully set for Thursday, July 16th.

2. My understanding of the catadioptric lens principles permit the following remarks.

a. As contrasted with a pure refracting lens system, the catadioptric lens for given focal lengths will allow larger apertures which lead to ultimately higher resolutions or to usable results under relatively poor optical conditions.

b. Because of the relatively large size of optical elements, the weight in a catadioptric system will be higher than that of a reflecting system. As pointed out in  memorandum, this seems to be in the order of 60 to 90 per cent in the range of focal lengths from 6 to 36 inches.

c. The sensitivity of a catadioptric system to vibration changes in temperature and pressure can be described quantitatively only after the detailed design of such a system has been completed.

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The geometry of the catadioptric system is in general much closer to that of our B system which has an excellent record. The latter involves two changes in direction in the optical path. The C system which has never demonstrated reliable performance and high resolution involves the use of five mirrors and a highly complex optical path. Since both the focal length and optical path of the catadioptric system I would expect to resemble the B camera, I do not as of this moment have any reason to believe that the catadioptric performance would be as catastrophic as that of the C camera. These matters will be gone into in detail with Rod Scott on Thursday.

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3. Both [ ] are following all known developments for improved emulsions and/or sensors. One such item is our recent procurement of 4,000 feet of Ansco High Scan Pan coated on Cronar which will be tested at the test site in the very near future. The tests will be made with the B Configuration and compare High Scan Pan with our present film. Samples of this photography will be forwarded to Rod Scott for evaluation and consideration for possible use of the High Scan Pan in the GUSTO program.

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4. A check with Headquarters ARDC shows that they are programming [ ] on Task No. 62171 to further investigate the use of single crystals of silver bromide for photographic purposes. No end product can be expected from this investigation within the next year. ARDC also indicated that additional funds at this time would not expedite the program.

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5. Major [ ] of PIC are planning to visit [ ] to review their progress on [ ] photography. While there, they plan to discuss with [ ] his proposed systems for testing a complete aerial photo system while still in the design stage.

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6. Progress Report No. 3, submitted by P&E, is attached. As you will note, a major portion of P&E design work is in a state of suspended animation pending selection of a specific airframe. The design work which is still active is limited to that of a generalized nature to compare major system alternatives. P&E have explored the film alternatives with Eastman Kodak, Dupont and Ansco as indicated on page 4. of the attached.

EUGENE P. KIEFER  
Chief, Technical Analysis Staff  
DPD-DD/P

Attachment:

P&E Progress Report No. 3